DOCUMENT RESUME

ED 287 278 EC 200 586

AUTHOR Willingham, Warren W.

TITLE Handicapped Applicants to College: An Analysis of Admissions Decisions: College Board Report No. 87-1.

INSTITUTION College Entrance Examination Board, New York, N.Y.
REPORT NO ETS-RR-87-1
PUB DATE 87
NOTE 24p.
AVAILABLE FROM College Board Publications, Box 886, New York, NY 10101 ($6.00).
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS Academic Ability; Access to Education; Admission Criteria; Admissions Officers; Aptitude Tests; *College Applicants; College Entrance Examinations; Decision Making; *Disabilities; Higher Education; *Selective Admission

ABSTRACT

The purpose of the study was to compare college admission decisions concerning handicapped and nonhandicapped applicants with comparable Scholastic Aptitude Test (SAT) scores and high school grades (HSG). The study focused on 1,539 handicapped students who applied to 121 institutions that participated in the College Entrance Examination Board's Summary Reporting Service in 1982-83. Predicted and actual admission rates were compared for a number of different groups of handicapped applicants. Compared to other applicants to the same college, the physically handicapped and visually impaired groups were slightly below average with respect to their academic qualifications; learning disabled students were lower; and hearing impaired applicants ranked lowest in relation to nonhandicapped applicants. In general, handicapped applicants tended to rank significantly lower on HSG than on SAT. Handicapped applicants were admitted on much the same basis as nonhandicapped applicants, but there were exceptions that favored hearing impaired applicants, disfavored small groups of visually impaired and physically handicapped applicants to small institutions, and disfavored learning disabled applicants to a small degree. Findings were inconsistent with the assumption that admissions officers focus special attention upon test scores (as opposed to the full student record) in evaluating the applications of handicapped students. Six figures and 11 tables are included. (Author/JW)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED287278

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

✓ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

College Board Report

No. 87-1

Handicapped Applicants to College: An Analysis of Admissions Decisions

Warren W. Willingham

"PERMISSION TO REPRODUCE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY

S. W. Gardner

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

EC 200586

Handicapped Applicants to College: An Analysis of Admissions Decisions

Warren W. Willingham

College Board Report No. 87-1

ETS RR No. 87-1

College Entrance Examination Board, New York, 1987

Warren W. Willingham is distinguished research scientist and assistant vice president for research at Educational Testing Service, Princeton, New Jersey.

Acknowledgments

A number of people made very helpful contributions to this study. I want to thank especially Margaret Morris, Bruce Kaplan, Alfred Rogers, and Ingeborg Novatkoski for their fine work on the data analysis, and Paul Rosenbaum and Robert Mislevy for useful suggestions. Thanks also to Colleen Scratchard and Leonard Ramist for assistance in developing the data file, to Linda Johnson and Nancy Robertson for help on several aspects of the work, and to Faye Frieson, Marjorie Ragosta, and Donald Rock for reviewing the report. Particular thanks go to Debra Smolinski for coordinating and typing the several drafts.

Researchers are encouraged to express freely their professional judgment. Therefore, points of view or opinions stated in College Board Reports do not necessarily represent official College Board position or policy.

The College Board is a nonprofit membership organization that provides tests and other educational services for students, schools, and colleges. The membership is composed of more than 2,500 colleges, schools, school systems, and education associations. Representatives of the members serve on the Board of Trustees and advisory councils and committees that consider the programs of the College Board and participate in the determination of its policies and activities.

Additional copies of this report may be obtained from College Board Publications, Box 886, New York, New York 10101. The price is $6.

Copyright © 1987 by College Entrance Examination Board. All rights reserved.
College Board, Scholastic Aptitude Test, SAT, and the acorn logo are registered trademarks of the College Entrance Examination Board.
Printed in the United States of America.

CONTENTS

Abstract 1

Introduction 1
Background 1
Research Questions 2

Related Research 3
The Labeling Effect 3
Admissions Studies 3

Procedure 5
The Sample 5
The Measures 5
The Analysis 6

Descriptive Data 7
Characteristics of the Sample 7
Relative Standing of Handicapped Applicants 9
Predicting Admissions Decisions 9

Residual Analyses 11
Types of Disabilities 11
Other Handicapped Subgroups 12
Score Level and Pattern 13
Flag Format 15

Summary 15

Notes 16

References 17

Figures

1. Illustrative Logistic Functions Showing the Relationships Between SAT Total Score and Probability of Being Admitted in Two Colleges 6

2. Selectivity of Institutions in this Sample Compared to that of Institutions in a National Sample 8

3. Mean, Standard Deviation, and Range for SAT and HSG of Handicapped Applicants Relative to All Applicants at the College of Application 9

4. Distribution of Point Biserial Correlations Between Admissions Decisions and SAT Total Score and High School Grades 10

5. Logistic Functions Showing the Probability of Admissions for Handicapped and Nonhandicapped Applicants, Based on Best Weighted Composite of SAT and HSG Within Colleges 11

6. Predicted vs. Actual Admissions Rates for Handicapped Applicants (Sample 1) 11

Tables

1. Proportion of Yearly National Samples of Freshmen Who Identified Themselves as Having Various Types of Disabilities or Handicaps 4

2. SAT and HSG Means and Standard Deviations for Handicapped and Nonhandicapped Groups (Sample 1) 7

3. SAT Means and Standard Deviations for Handicapped and Nonhandicapped Groups (Sample 2) 7

4. Comparison of SAT Performance Across Three Studies of Disabled Candidates Taking Special Test Administration of the SAT 8

5. Point Biserial Correlations Between Predicted and Actual Admissions Decisions (Sample 1) 10

6. Residual Admissions Rates for Sample 1 vs. Sample 2 and One vs. Two Predictors 12

7. Residual Admissions Rates for Handicapped Applicants by Sex and Type of College 13

8. Residual Admissions Rates for Learning Disabled and Visually Impaired Applicants by Type of Examination 13

9. Residual Admissions Rates of Handicapped Applicants for Whom Possibility of Admission Was Low, Uncertain, or High 14

10. Residual Admissions for Learning Disabled Applicants with Discrepant SAT/HSG Scores 15

11. Residual Admissions Rates for Handicapped Applicants According to Whether Flags Were Transmitted on Score Reports or Rosters 15

A. Logistic Prediction of Admissions Decisions from SAT and HSG for a Pooled Sample of Handicapped (N = 1,539) and Nonhandicapped (N = 5,328) Applicants — Regression Weights for Three Models Based on Different Variables 17

ABSTRACT

Federal regulations protect the rights of handicapped students regarding admissions testing and the admissions process generally. The purpose of this study was to compare admissions decisions of handicapped and nonhandicapped applicants who have comparable Scholastic Aptitude Test (SAT) scores and high school grades (HSG). The main finding was that handicapped applicants were admitted on much the same basis as nonhandicapped applicants, but there were exceptions that favored hearing impaired applicants, disfavored small groups of visually impaired and physically handicapped applicants to small institutions, and disfavored learning disabled applicants to a small degree. The results appeared inconsistent with the assumption that colleges give special attention to flagged test scores of handicapped applicants.

INTRODUCTION

Special administrations of the Scholastic Aptitude Test (SAT) have been offered for many years in an effort to ensure fair testing conditions for handicapped persons. One issue that has attracted much recent attention is the long-accepted practice of "flagging" (i.e., identifying to users) any such scores from tests administered under nonstandard conditions. Scores are flagged so that users will know that the reliability and validity of scores are uncertain and that their meaning therefore may not be comparable to that of other scores.

Some oppose the practice of identifying scores from test administrations modified for handicapped examinees on the grounds that such flagging may adversely affect admissions decisions. In fact, very little is known about how handicapped applicants fare in the admissions process. How do the academic qualifications of applicants who have had a nonstandard SAT administration compare with those of other applicants to the same institution? Are handicapped students more or less likely to be admitted than their scores and secondary school grades would indicate? Do their scores receive more or less weight in admissions decisions than is the case with scores of nonhandicapped applicants? The purpose of this study is to shed additional light on such questions.

Background

Special test administrations for handicapped examinees provide for three types of modification as may be appropriate in the individual case: (1) an alternate test format such as large type, braille, or audio cassette; (2) special testing arrangements such as a private room, a recorder, or another type of assistance; and (3) extended time to complete the test (Admissions Testing Program 1985). Provision of extended time with the regular test booklet and answer sheet is by far the most common form of nonstandard test administration. Most of these special arrangements have been available for 20 years or more, though federal legislation and ensuing regulations in the 1970s greatly enhanced public and professional interest in conditions of testing handicapped persons.

Section 504 of the Rehabilitation Act of 1973 states that "no otherwise qualified individual shall, solely by reason of his handicap, be excluded from the participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance" (DHEW 1977, p. 22676). The regulations implementing Section 504 call for

(a) validation of admissions tests whenever they have an adverse differential effect on handicapped people;
(b) the administration of such tests in a manner to insure that the results reflect candidates' achievement levels rather than their disabilities (i.e., that the scores are comparable to those of standard administrations); and
(c) a prohibition against pre-admission inquiry about handicapping condition (in effect, no flagging).

The number of handicapped examinees is not large – about 5,000 to 6,000 nonstandard SATs are administered per year. Furthermore, this group must be subdivided for research purposes into several types of handicapping conditions, several types of nonstandard SAT administrations, and many different educational institutions. Because of this fragmentation of limited data, research on handicapped examinees is very difficult, and there is limited information on validity or comparability of scores. Aside from the practical difficulty of obtaining sufficient data for research, it is not clear that achieving comparability is technically feasible. Absent evidence that scores from nonstandard administrations can be interpreted in the same manner as other scores, professional standards now require that users be cautioned. Standard 14.2 of the American Educational Research Association/American Psychological Association/National Council on Measurement in Education (1985) *Standards for Educational and Psychological Testing* states:

> Until tests have been validated for people who have specific handicapping conditions, test publishers should issue cautionary statements in manuals and elsewhere regarding confidence in interpretations based on such test scores.

Recognizing the conflict between the proposed 504 Regulations and the state-of-the-art in testing handicapped examinees, the Office of Civil Rights (OCR) endorsed an "interim policy" in 1978 holding in abeyance any ban on pre-admission inquiry regarding handicapping condition (Redden, Levering, DiQuinzio 1978)[1]. The OCR also appointed a Panel on Testing of Handicapped People under the auspices of the National Academy of Science (NAS) to suggest steps for dealing with the dilemma. In its report (Sherman and Robinson 1982) the Panel recommended a

research period of over four years, during which time test sponsors should address a variety of questions concerning test validity for handicapped examinees. Such a program of research was initiated under joint sponsorship of the College Board, the Graduate Record Examinations Board, and the Educational Testing Service (ETS). Meanwhile, ETS flags scores from nonstandard administrations under the interim policy (ETS 1985).

Results of the ongoing research will provide valuable information concerning the reliability and validity of the scores in question, especially as to whether test scores of handicapped and nonhandicapped applicants are comparable with respect to expected academic performance in college. But ultimately, decisions regarding the testing of handicapped people are not likely to be based upon measurement considerations alone. How tests are used and the consequences of their use must be considered as well, because prohibition against flagging in the 504 Regulations presents a problem of conflicting values.

On the one hand, it is important to protect the privacy of handicapped individuals and to guard against any possible bias in admissions decisions. Such bias could operate, quite unconsciously, due to false assumptions regarding the ability of disabled students to succeed or concern over the possibility that they may place an added burden on the educational resources of the institution. On the other hand, a principal function of standardized admissions tests is to provide a common objective standard in order to evaluate the academic promise of all applicants fairly. Consequential exceptions to that standardization that are allowed to pass unnoticed can be unfair to other students and jeopardize the integrity of the tests and the admissions process. An important consideration in weighing these conflicting values is the degree of disadvantage handicapped persons may experience in admissions. A systematic study of actual admissions decisions should be helpful in assessing that possible disadvantage.

Research Questions

As stated in the American Association of Collegiate Registrars and Admissions Officers and American Council on Education's Guide for Compliance with Section 504 of the Rehabilitation Act of 1973, "Institutions are *not* required to alter standards but only to apply them equally to all applicants" (Redden, Levering, DiQuinzio 1978). To what extent standards are applied equally to handicapped applicants is the central theme of this study.

The best current answers to questions of test use with handicapped applicants turn largely on how people *think* the tests are used. It is possible to learn a great deal about actual admissions decisions for handicapped applicants with data on admissions decisions that are available through the Summary Reporting Service of the College Board's Admissions Testing Program. This requires establishing, on the basis of school grades and test scores, the likelihood that a given applicant would be admitted to a particular college, and then determining whether handicapped applicants are admitted as frequently as would be expected. If not, such a finding would suggest a possible bias in the selection process.

It may not be possible, of course, to distinguish the effect of a flag on the score from knowledge of the student's record. Without further information it would be unwarranted to conclude that an apparent pattern of bias in admissions decisions affecting a particular group with flagged scores was due to the flag, per se. A flag on a test score could have a direct, presumably negative, influence if the admissions officer perceived the score as "too high" due to the nonstandard administration. On the other hand, it is equally plausible, if not more so, to assume in such an instance that it was the knowledge of a handicapping condition rather than the flag itself that influenced the decision.

In any event, evidence of bias against handicapped applicants would speak against flagging scores, for it is readily argued that flags can facilitate a bias by making it easier to identify an applicant as handicapped when that might not otherwise have been obvious. And that is the worry that has caused some to question the flagging practice.

Analysis of actual admissions decisions may show that worry to be either largely unfounded, or perhaps worse than imagined. The factual analysis here described bears on the larger social issue of fairness with respect to the consequences of flagging or not flagging – fairness to handicapped people and also fairness to the generality of college-going students who depend upon the evenhandedness of testing. This study focuses on several specific questions:

1. How do handicapped applicants stand on SAT scores versus high school grades? To what extent are the academic credentials of handicapped applicants similar to those of other applicants at the same institution? It seems commonly assumed, though not documented, that there is greater score differential between handicapped and nonhandicapped people on test scores than on school grades.
2. Are handicapped applicants more or less likely to be admitted than nonhandicapped applicants with comparable high school grades and SAT scores? Does the pattern of expected and actual acceptance rates vary for different types of handicapping conditions or types of test administration? Since type of handicap varies enormously, there is little reason to expect uniform results.
3. Does the pattern of expected versus actual admissions rates vary for important subgroups of handicapped students – especially for men and women, and for students at different levels of admissibility? It is plausible that differential patterns would show up only among those of marginal admissibility; that is, that handicapped status may have little effect when the applicant is, anyway, very likely or very unlikely to be admitted.

4. Does the pattern of expected and actual admissions rates vary by type of college – especially control (public/private), size, selectivity level, and availability of special programs for handicapped students?
5. In making admissions decisions regarding handicapped applicants, do institutions place greater or less weight on high school grades and SAT scores than is the case for nonhandicapped students?

RELATED RESEARCH

There are two rather different types of research that have some relevance for the present study. One concerns the effect on decision making of knowing that someone is handicapped. Another is research bearing on the admission of handicapped students to college. The NAS Panel on Testing of Handicapped People was especially concerned with the former issue, which might be called the "labeling" effect. The Panel commissioned a review of research on that topic, a brief version of which appears as an appendix to the Panel report (Guskin 1982).

The Labeling Effect

The Guskin review covers a wide variety of research: social attitudes toward handicapped people, behavior of children, reaction to handicapped individuals in various interpersonal situations, and the effects of knowing a person's status when making evaluations of his or her performance, suitability for a job, etc. This literature provides useful background, though none of the studies concerns judgments about applicants to college. Nonetheless, three types of studies from this literature are relevant because they speak to the possible effects of labeling in a selection situation – in this case, employment.

One simple approach is to ask employers to rate the employability of different categories of job applicants. Two such studies involving personnel directors and school administrators produced generally similar results, namely, the more severe the handicap, the less employable the individual was perceived to be (Rickard et al. 1963; Nikoloff 1962). Such studies demonstrate the potential for prejudice in selection. But the implications of attitudinal data are hard to interpret because they are so far removed from real situations.

An improved study requires subjects to rate simulated job résumés in which applicants are labeled "handicapped" or "nonhandicapped," all other facts remaining constant. Krefting and Brief (1977) did such a study in which applicants for a typing position were characterized as confined to a wheelchair but otherwise well qualified and well adjusted. This study showed no main effect of the disability on the overall rating of the applicant, but there was an interaction with experience. Among inexperienced applicants, those with a disability were somewhat preferred. Rose and Brief (1979) did a similar study and found no consistent negative effect of disability. Both these studies involved student raters rather than actual administrators, and both described the applicant as highly qualified. It is uncertain how informative such studies actually are since the task is somewhat artificial. Respondents may find it easy to assume a liberal position – that is, one favorable to the handicapped person.

Two other studies involved personnel directors in natural situations. Farina and Felner (1973) sent a confederate out on interviews, in half of which he identified himself as having been mentally ill. Johnson and Heal (1976) did a similar study involving a female applicant, half the time in a wheelchair. Several lines of evidence suggested that handicapped applicants were treated in a biased fashion: fewer offers of jobs, fewer invitations to additional interviews, unfriendliness, or discouragement by the interviewer.

After reviewing the entire body of research available on this topic, the NAS panel concluded as follows:

> Briefly summarized, the research literature on the effects on decision making of knowing a person is handicapped shows varied results. Knowing that an individual is handicapped may, in different situations, have negative, positive, or negligible effects. In short, research does not support the common assumption that knowledge of a person's handicapping condition works to that person's disadvantage. Opinions expressed in the panel's open meeting were similarly varied.

Admissions Studies

A second body of research not covered by Guskin concerns the admissions process. One point of interest is to what extent handicapped individuals may be underrepresented in higher education and whether there is any evidence of improved access since the promulgation of the 504 Regulations. The best source of information on college enrollment of handicapped people is probably the annual survey of college freshmen carried out by the Cooperative Institutional Research Program (Astin et al. 1985). Since 1978, a large representative sample of freshmen have been asked whether they have any hearing impairment, learning disability, visual impairment, etc. Using those 1978 data to provide a profile of disabled college freshmen, the President's Commission on Employment of the Handicapped reported that "handicapped youth are seriously underrepresented in higher education" – 2.6 percent versus 8.1 percent in the general population (President's Commission, undated). As Table 1 indicates, the percentage of handicapped freshmen increased by 1985 to 7.7 percent. At first blush, this would appear to indicate a substantial increase in the rate of access. Closer analysis, however, suggests that the form of the question put to the freshmen had a pronounced effect on their replies. For example, between 1980 and 1981 the various alternative disabilities that could be checked by freshman respondents (visual, hearing, etc.) remained much the same, but the lead

Table 1. Proportion of Yearly National Samples of Freshmen Who Identified Themselves as Having Various Types of Disabilities or Handicaps

Type of Disability	*Proportion of All Freshmen*								
	1978	*1979*	*1980*	*	*1981*	*1982*	*	*1983*	*1984*	*1985*
Hearing	.003	.003	.003		.005	.005		.007	.009	.009
Speech	.001	.001	.001		.001	.001		.003	.003	.003
Visual	.010	.010	.008		.028	.025		.022	.019	.021
Orthopedic	.005	.004	.005		.008	.007		.009	.010	.090
Learning	.001	.001	.002		.003	.003		.007	.009	.011
Health Related	–	–	–		.007	.006		.009	.010	.012
Other	.005	.004	.004		.003	.004		.012	.013	.012
Unspecified	.002	.005	.005		.002	.003		–	–	–
Total	.027	.028	.028	*	.057	.054	*	.069	.073	.077

Source: Astin et al., 1985 and earlier years

*Change in questionnaire; see Note 2

question changed from "Do you consider yourself physically handicapped?" to "Are you disabled?" From 1983 on, the total percentage disabled was reported in a manner that included multiple handicaps, whereas before it did not. (See Note 2 for exact wording of the survey questions.)

The data suggest that the modified wording encouraged more students to respond affirmatively. In fact, 88 percent of the overall increase from 1978 to 1985 occurred in those two yearly intervals when there was a change in the question, whereas only 12 percent of the increase occurred over the five yearly intervals when there was no change in the question. Thus it is not clear whether there was any significant improvement from 1978 to 1985 in the access of handicapped persons to higher education. These data dramatize the likely unreliability of self-reported data on disabilities and the extent to which such information may be influenced by apparently minor changes in the wording of survey questions.

Two questions in the 1978 freshman profile provide some comparison of the experience of handicapped and nonhandicapped applicants in the college admissions process (President's Commission, undated). Handicapped students filed about the same number of applications as did nonhandicapped (2.5 versus 2.4). Were their applications equally successful? Apparently so, if one judges by the percentage admitted to their first-choice institution (75 percent for handicapped applicants, 76 percent for nonhandicapped).

One might also look to admissions practices and policies for signs of possible changes affecting handicapped students. As it happens, there have been two major surveys concerning undergraduate admissions in recent years. One survey was carried out in 1979 by the American Association of Collegiate Registrars and Admissions Officers and the College Board (1980). The second survey was done six years later under the auspices of the same organizations plus the American College Testing Program, the Educational Testing Service, and the National Association of College Admissions Counselors (Breland, Wilder, and Robertson, in preparation). These two surveys were based upon questionnaires that were purposely quite similar. Both contained two questions concerning handicapped students – one dealing with recruitment, the other with exceptions to formal admissions requirements.

In the 1980 report, roughly one senior institution in four reported special recruiting of handicapped students. Six years later, over half responded affirmatively to that question. This substantial increase may be partly due to the generally heightened level of recruitment in recent years. The increase may also result partly from the fact that the earlier question referred to "physically handicapped," while the subsequent survey used the more generic term "handicapped." When respondents to the later survey were specifically questioned on the relative level of recruiting activity in 1979 and 1985, they did report some increase in the recruiting of handicapped students, but typically not nearly as much as was reported for other subgroups such as minorities, adults, students with special talents, etc.

In the 1985 survey, respondents indicated that they were making fewer exceptions to admissions standards in the case of handicapped applicants in 1985 as compared to 1979. The same trends were reported in the case of minority students, children of alumni, and athletes. This may not represent a real tightening of admissions standards. One curious aspect of the 1985 survey was the fact that admissions officers responded to several different questions in ways that suggested tightening standards, though heightened recruiting and the general enrollment picture are not entirely consistent with that assumption. Responses to this question suggested that handicapped applicants are admitted as exceptions (some one in four) about as often as athletes and more often than alumni children, but not as frequently as minority students.

In 1984, Oltman and Hartnett reported the results of a survey that included questions concerning test use specifically. For that reason, it is of interest even though it was directed toward graduate departments. Only 8 percent of the respondents reported having any formal policies concerning the admission of handicapped students. Typically these

policies were simply statements of nondiscrimination. Very few respondents (2 percent) reported any different weighting of admissions criteria when considering handicapped applicants. When asked whether they interpreted flagged test scores any differently from scores that were not flagged, 6 percent checked "yes" but usually elaborated only to say that other factors were carefully considered.

Neither of these two lines of research — college admissions or the effects of labeling — seems to offer any very clear-cut conclusions as to how handicapped students fare in the admissions process. Part of the problem is that much of this work is based upon what respondents say they do or would do in a given situation. Such sentiments are significant as expressions of personal values or policy positions. Nonetheless, they are not the same as an accounting of actions and can not necessarily be generalized to real situations. People often are not conscious of the subtle biases in their actions and typically have no means of systematically observing whether they react to people or reach decisions in a way that is consistent with their intention. In an analysis of admissions decisions, for example, Willingham and Breland (1982) found substantial discrepancies between the factors admissions officers intended to stress in selecting students and the outcome of their actual decisions.

Some of the studies cited do clearly suggest that handicapped status can affect an observer's behavior and judgment. How often that occurs in college admissions and to what net effect is an open question to which research up to now does not speak very usefully. That is partly due to the fact that no research has addressed the question directly. For that reason, the present study promises to complement what we now know about this topic.

PROCEDURE

The central question in this study is whether selective colleges use the same standards in reaching admissions decisions for handicapped and nonhandicapped applicants. Since admissions officers consider many factors in reviewing an individual application, it is not feasible, either theoretically or practically, to take into account all institutional standards in order to evaluate whether admissions decisions are fair for handicapped students. It is possible, however, to approximate an answer to the question by determining how admissions decisions for handicapped applicants vary with the academic standards most commonly employed in the admissions process. Admissions officers report that high school performance and admissions test scores receive by far the most weight in admissions decisions (American Association of Collegiate Registrars and Admissions Officers and the College Board 1980), and that is confirmed by statistical analysis of actual admissions decisions (Willingham and Breland 1982). So the approach followed in this study is to determine for individual colleges the likelihood that an applicant will be admitted with given SAT scores and school grades, and then to determine whether a handicapped applicant with the same scores and grades is equally likely to be admitted.

The study makes use of data available in the College Board's summary reporting service. Each year a number of institutions report back to the ETS the admissions decisions they have made on each applicant and whether or not those accepted students actually enrolled. Analyses useful in recruitment and enrollment maintenance are then carried out for the institution. In the present study, these data provide a basis for determining the selection standards of individual institutions (based on scores and school grades alone) and in turn, how selection decisions concerning handicapped applicants compare to those standards. Information on handicapped applicants was available from a separate ETS file based on applications for special test administrations.

The Sample

The sampling objective was to locate concentrations of handicapped applicants among those institutions that participated in the Summary Reporting Service (SRS) in 1983. Accordingly, 129 SRS institutions were identified that received 12 or more score reports that year based upon special test administrations. Among these colleges, three had unusable data and five others were not included because they selected 95 percent or more of their applicants. The study is based upon the remaining 121 colleges; they received 597,356 applications.

Among these were 1,975 applications from handicapped students who had special test administrations. These included 96 with a hearing impairment, 1,438 with a learning disability, 128 who were physically handicapped, and 313 with a visual impairment. Data on high school performance were missing for 11 percent of the nonhandicapped applicants who did not complete the Student Descriptive Questionnaire (SDQ). Among the handicapped applicants, that data loss was 22 percent. Therefore, the analysis distinguishes Sample 1 with complete data (N = 1,539) and Sample 2 with test score data but no school performance data (N = 1,975).

The Measures

Two types of admissions criteria were used for the purposes of this analysis: SAT scores and school performance. A preliminary analysis indicated that for predicting admissions decisions, it made relatively little difference whether verbal and mathematical scores were kept separate or combined into one SAT total score. Accordingly, the total score was used in order to simplify the analysis and reporting.

Developing a measure of academic performance in secondary school posed a problem due to the fact that neither transcripts nor school-reported rank was available. Self-reported information was available in the SDQ: the most recent grade in four subjects, and a rough approximation of class rank. Both the estimate of class rank and an average

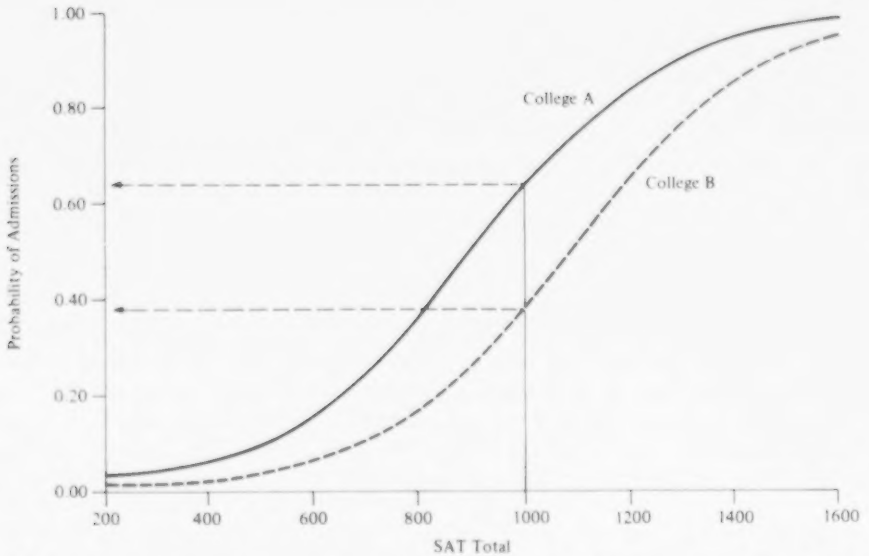

Figure 1. Illustrative Logistic Functions Showing the Relationships Between SAT Total Score and Probability of Being Admitted in Two Colleges.

grade based upon the four subjects were potentially useful. Preliminary analysis indicated that the two measures were correlated almost equally with admissions decisions. For the purposes of this study, there was no good argument for using one over the other. A more important consideration was to use the best available indicator of academic performance in secondary school in order to develop the best prediction of admissions decisions in each college. Accordingly, both types of information reported by the student were combined into a composite High School Grade (HSG, see Note 3). This HSG proved to be a reasonably good predictor of admissions decisions and was therefore serviceable for the purpose at hand. It certainly does not accurately represent, however, the extent to which admissions decisions are based upon school performance or the manner in which that performance is evaluated by the college. In actual admissions decisions, more accurate and detailed information is normally in front of the admissions officer.

In a secondary analysis, data were sorted on several institutional characteristics to determine whether there were any systematic differences in residual admissions rates for public and private colleges and institutions differing with respect to size, selectivity, and whether or not they had a special program for handicapped students. Larger and smaller institutions were defined here, arbitrarily, as having a freshman class above or below 1,000. An admission rate of .50 was the dividing line between colleges of higher and lower selectivity. Each of the 121 institutions was coded as to whether or not it reported a special program designed for each of the four types of handicaps (Liscio 1986a and 1986b; Mangrum and Strichart 1985; Rawlings, Karchmer, and DeCaro 1983). Individual handicapped applicants were coded as applying to a college with a special program if the institution reported having a program that matched the individual's particular handicap.

The Analysis

The primary method of analysis followed a model described and utilized extensively in the Personal Qualities Project (Willingham and Breland 1982; Willingham 1985). The analysis involves two steps: first, a prediction of what proportion of a particular group one would expect to be admitted on the basis of their academic qualifications, and second, a comparison of that prediction with the proportion actually admitted. In predicting a dichotomous criterion such as a "yes/no" admissions decision, logistic regression is generally far superior to linear regression. This is particularly true when predictions are used for residual analysis because predictions based upon linear regression can be seriously in error near the extremes of the predictor. This is due to the fact that the logistic function curves to stay within the natural criterion boundaries of 0 and 1, whereas the linear line of regression extends to impossible predicted scores above and below those natural limits. This point is illustrated in Figure 1, which shows logistic functions for two colleges.

Both college A and college B in Figure 1 had SAT-total (SAT-T) means (verbal and mathematical) of 1116, and in both cases the correlation between SAT-T and the admissions decision was about .37, the average value for the 121 colleges. As the curves indicate, however, the two colleges differed in selectivity. College A admitted about three out of four applicants, whereas college B admitted only one in two. As the figure indicates, the probability of admission for an applicant with an SAT-T of 1000 would be .38 in college B and .64 in college A. Similarly, such logistic predictions take

Table 2. SAT and HSG Means and Standard Deviations for Handicapped and Nonhandicapped Groups (Sample 1)

		SAT-V		SAT-M		SAT-T		HSG	
Group	N	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
Hearing impaired	75	343	118	463	138	806	235	2.80	.55
Learning disabled	1,116	425	94	502	129	927	199	2.67	.52
Physically handicapped	92	484	89	537	131	1020	188	3.14	.44
Visually impaired	256	463	102	531	127	994	209	2.98	.57
Total handicapped	1,539	431	100	507	130	938	207	2.76	.55
All applicants	532,750	483	107	534	115	1018	202	3.23	.55

Table 3. SAT Means and Standard Deviations for Handicapped and Nonhandicapped Groups (Sample 2)

		SAT-V		SAT-M		SAT-T	
Group	N	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
Hearing impaired	96	350	124	461	141	810	243
Learning disabled	1,438	431	93	503	127	933	197
Physically handicapped	128	498	96	542	129	1040	192
Visually impaired	313	464	99	534	131	998	210
Total handicapped	1,975	436	100	508	130	944	207
All applicants	597,356	483	108	533	115	1015	204

into account the fact that an applicant's probability of admission to two colleges with the same selection rate may differ substantially because of differences in the academic ability of the two groups of applicants.

For each of the 121 colleges, such logistic functions were computed on the basis of an equation of the type

$$P_a = \frac{1}{1 + e^{-\mathbf{XB}}}$$

where P_a is the probability of admission, and **X** and **B** refer to vectors of scores and logistic weights, respectively. Maximum-likelihood estimation procedures are used to determine the weights (Walker and Duncan 1967). Predictions were based upon SAT-T or HSG or both. The "residual analysis" then works as follows.

A group of applicants is identified for evaluation (e.g., physically disabled students who applied to small colleges). An estimate is made of the likelihood that each individual in the group will be admitted, using a logistic function for the college in question as represented by the equation above and illustrated in Figure 1. Summing these estimates gives an expected proportion of the group that would be admitted purely on the basis of the academic measures. This figure is compared with the proportion of the group that was actually admitted; the result is a residual selection rate. For example, if one would expect to admit 46 percent of a group on the basis of their academic credentials, while 54 percent were actually admitted, the residual selection rate would be + .08. Before concluding that this constitutes evidence of a positive admissions preference for the group, it is necessary to determine whether this figure differs significantly from zero (see Note 4).

DESCRIPTIVE DATA

Characteristics of the Sample

Most of the analyses in this study were based upon Sample 1, the group of handicapped students for whom full data were available. Means and standard deviations for the handicapped groups and the half million applicants to these colleges are shown in Table 2. Overall, the handicapped students scored about half a standard deviation below the nonhandicapped students on the SAT. On HSG, they were almost a full standard deviation lower. As has been reported in earlier studies, the physically handicapped (PH) and visually impaired (VI) groups were fairly close to nonhandicapped students with respect to academic qualifications. The learning disabled (LD) students came next, and the hearing impaired (HI) ranked lowest on HSG and SAT. Three of the handicapped groups (LD, PH, VI) scored some 50–75 points higher on SAT-M than on SAT-V. For the hearing impaired group, the difference was 120 points. Handicapped applicants tended to score higher on the SAT than HSG

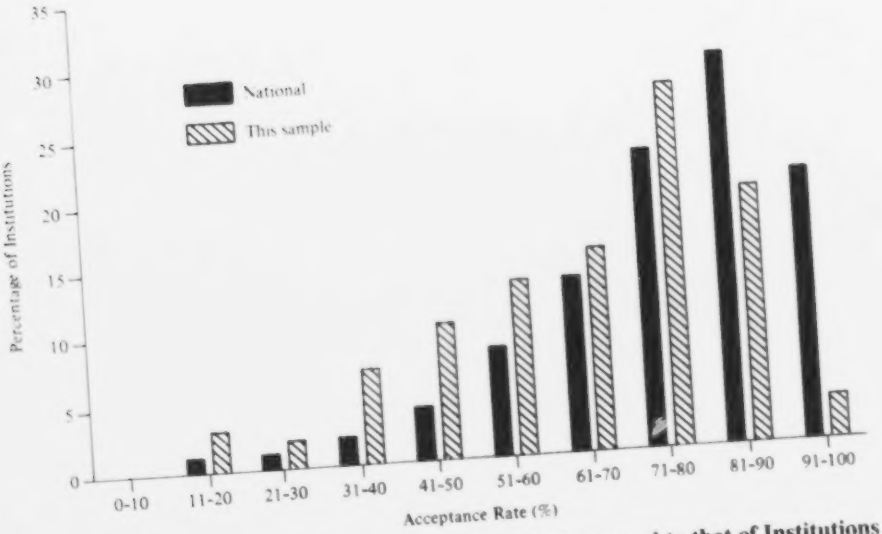

Figure 2. Selectivity of Institutions in this Sample Compared to that of Institutions in a National Sample.

relative to nonhandicapped applicants. We will examine that pattern more closely in a following section.

Table 3 shows SAT data for the larger Sample 2 that lacked HSG scores. These means and standard deviations tend to be quite close to those in Table 2, indicating, from this perspective at least, that the loss of 22 percent of the data due to lack of HSG information did not bias the sample to any significant degree. The pattern of predicted and actual admissions decisions is another important test of the comparability of Samples 1 and 2 yet to be examined.

In considering how the results of this study may be generalized, it is useful to examine the sample of colleges represented. They are almost all four-year institutions; universities and prominent institutions are heavily represented. One would guess that these institutions are more selective than four-year colleges generally. This assumption is borne out by Figure 2, which gives a frequency distribution of the acceptance rates for this sample as compared with a national sample of four-year institutions responding to a recent survey (Breland, Wilder, and Robertson, in preparation). As the figure shows, the present sample includes relatively few institutions that accept 80 to 90 percent of their applicants and relatively many of the very selective institutions; i.e., those accepting less than half their applicants.

Overall, 62 percent of the applicants to these 121 institutions were admitted; the corresponding figure in the national survey was 75 percent. Thus this sample of colleges leans toward the more selective institutions. This is no doubt due to the fact that it is based on colleges that use the College Board's Summary Reporting Service. That program is especially popular with competitive institutions interested in monitoring the effectiveness of their regional and national recruiting activities. However, we have here a good representation of institutions at all levels of selective admission — a sampling quite appropriate to the purposes of the study.

As might be expected, this sample of handicapped students has somewhat higher SAT scores than the generality of handicapped students who take the SAT under special conditions of administration. That is illustrated in Table 4, which compares this sample with two previous studies. The study by Bennett, Rock, and Kaplan (1985) was based upon a sample fairly representative of all special test examinees and

Table 4. Comparison of SAT Performance Across Three Studies of Disabled Candidates Taking Special Test Administration of the SAT

	Bennett, Rock, and Kaplan (derived data)	*Braun, Ragosta, and Kaplan Sample 1*	*Current Study Sample 1*
Sample Size			
Hearing impaired	456	84	75
Learning disabled	6,453	437	1,116
Physically handicapped	644	72	92
Visually impaired	1,751	171	256
SAT-V Mean Scores			
Hearing impaired	298	315	343
Learning disabled	369	412	425
Physically handicapped	427	462	484
Visually impaired	418	452	463
SAT-M Mean Scores			
Hearing impaired	385	429	463
Learning disabled	406	477	502
Physically handicapped	444	519	537
Visually impaired	450	502	531

All SAT takers, 1982–83: SAT-V mean was 425, S.D. 110; SAT-M mean was 468, S.D. 119 (College Board 1983).

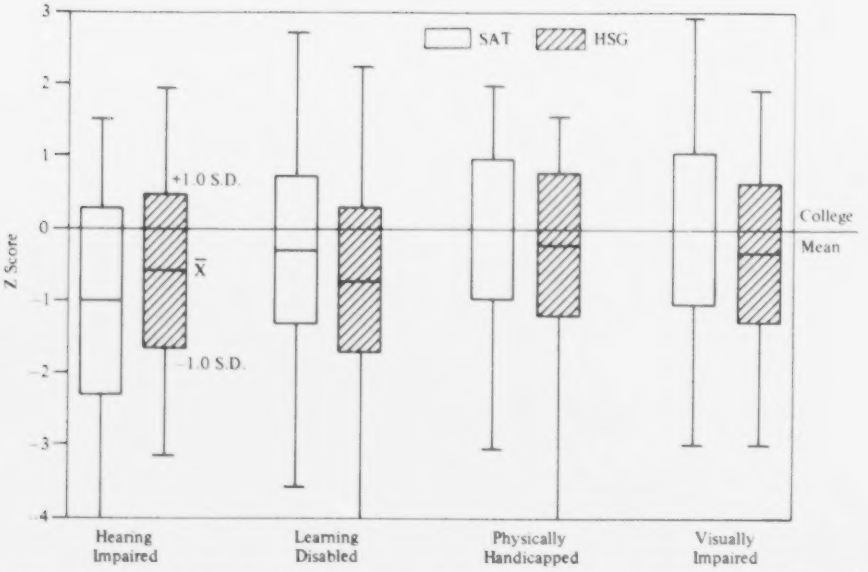

Figure 3. Mean, Standard Deviation, and Range for SAT and HSG of Handicapped Applicants Relative to All Applicants at the College of Application.

has the lowest mean scores of the three studies. The study by Braun, Ragosta, and Kaplan (in press) was restricted to four-year institutions and shows somewhat higher means. Higher still are the means of the current study. In fact, except for the hearing impaired group, these mean SAT scores were somewhat higher than the average for all test takers nationally.

Relative Standing of Handicapped Applicants

In the Section 504 regulations concerning the validation and use of admissions criteria, one key issue is "disproportionate adverse effect." The regulations (DHEW 1977) stipulate that an institution subject to the Rehabilitation Act of 1983

> may not make use of any test or criterion for admission that has a disproportionate, adverse effect on handicapped persons or any class of handicapped persons unless (i) the test or criterion, as used by the recipient, has been validated as a predictor of success in the education program or activity in question and (ii) alternate tests or criteria that have a less disproportionate, adverse effect are not shown by the Director to be available [Section 84.42(b)(2)].

Since the regulations do not define disproportionate adverse effect, it is not clear on what basis an institution would decide whether its admissions process is subject to the mandate. One complication is the fact that adverse effect has been previously defined with respect to cutting scores in an employment context. However, educational institutions seldom use a cutting score on a single admissions criterion. More often a number of criteria may be considered and a given measure may have only a minor effect on the admissions decisions of a given institution.

Nonetheless, it is useful to examine the standing of these handicapped applicants relative to other applicants at the same college. Such relative standing is indicated in Figure 3, which shows for each handicapped group a distribution of Z scores for SAT and HSG. The Z scores are based upon the full applicant group at the college to which the handicapped student applied. These data provide only an approximation. The relative standing of handicapped applicants at particular colleges may vary widely.

As the figure shows, visually impaired and physically handicapped applicants had approximately the same mean SAT scores as other applicants to the same colleges. Test scores of learning disabled applicants were lower; scores of hearing impaired applicants were substantially lower. On HSG, handicapped applicants ranked lower than other applicants fairly consistently. For each of the groups, save hearing impaired students, the average HSG was significantly lower than the average SAT. For the total group of handicapped students, 39 percent were above average on the SAT and only 24 percent were above average on the HSG. Overall, about two handicapped applicants out of three ranked higher on SAT scores than on HSG relative to the nonhandicapped applicants. This is not a surprising result in light of the fact that federal regulations and ensuing professional practice have focused on low school achievement in relation to ability in defining learning disabled students, by far the largest handicapped group (see Willingham 1986).

Predicting Admissions Decisions

In determining whether the same standards are employed in admitting handicapped applicants, we use here the SAT and

Median = .37

R's for SAT-T	−.00	05
	.00	325
	.10	89848
	.20	40505829895072388166620
	.30	771695768204625089636225338272166890
	.40	5330093879882070014438921260757512117O
	.50	54100237324491

Median = .36

R's for HSG	.00	162
	.10	666967988
	.20	586571654070756703978734221
	.30	335843786445692037275084918458376S
	.40	26424394607127428341957246003141721 25
	.50	5136150061
	.60	2

Median = .45

R's for SAT and HSG	.00	277
	.10	7
	.20	6937196269972944
	.30	559861520756605376986
	.40	1670871742754743152091454680694487664
	.50	330048748007580589571215537740902 2
	.60	032510252

Figure 4. Distribution of Point Biserial Correlations Between Admissions Decisions and SAT Total and High School Grades.

HSG to establish the baseline. So it is useful to ask first to what extent SAT scores and HSG – separately and together – do account for admissions decisions. Then, what about the handicapped students? Is there evidence of undue weight on either measure, or any significant departure from the pattern of admissions decisions for a given SAT and HSG than is normally observed for nonhandicapped applicants? The stem and leaf diagram in Figure 4 shows the distribution of correlations between admissions decisions and the two predictors. These data indicate that there are very few institutions in which admissions decisions are relatively unrelated to SAT or HSG (i.e., show a correlation of less than .20). In no institution is the correlation much over .50–.60, as would be the case if a cutoff score were used.

The median correlations for SAT and HSG were essentially the same: .37 for SAT, .36 for HSG. The two predictors contributed about equally to produce a multiple R of .45, still a moderate correlation considering that these two measures are commonly perceived to carry most of the weight in admissions decisions. The median figure for HSG is probably best regarded as a lower bound for the true effect of high school record on admissions decisions. This index is based upon self-reported information and is certainly an incomplete representation of the student's work in secondary school.

In order to compare the predictability of admissions decisions for handicapped and nonhandicapped applicants, the predicted decisions (based on the logistic functions for individual colleges) were correlated with the actual decisions. This allows the data for the handicapped groups to be pooled across numerous colleges without the correlations being seriously distorted by wide variation in admissions standards (as illustrated by Colleges A and B in Figure 1). The results are shown in Table 5.

Since these correlations are based upon pooled data and a broader score range than is found in individual institutions, the "all applicants" estimates in the bottom line are larger than the median correlations reported in Figure 4. Admissions decisions for the total handicapped group tend to be slightly less predictable than decisions for applicants generally. This seems largely due to the fact that correlations for the very large learning disabled group are consistently lower than those for the "all applicant" sample. On the other hand, the correlations among the four handicapped groups do not differ significantly for either the SAT, the HSG, or the combination of the two. These data suggest that the two measures account for admissions decisions of handicapped applicants in much the same way as for nonhandicapped applicants; but to some small degree the SAT and school grades receive less weight as other factors are taken into account. That interpretation tends to be supported by results of a logistic regression model that provided a direct test of the interaction of handicapped status with individual predictions (see Note 5).

Figure 5 gives a visual representation of the increasing probability of an applicant being admitted as SAT and HSG increase. These logistic functions are based upon a best weighted composite of SAT and HSG rescaled so as to take into account institutional differences in admissions standards (see Note 6). This figure confirms that for applicants with the same SAT and HSG, admissions decisions for handicapped students correspond quite closely to those for nonhandicapped applicants. However, the curves do separate somewhat in the upper range. For applicants whose SAT and HSG

Table 5. Point Biserial Correlations Between Predicted and Actual Admissions Decisions (Sample 1)

		Predictions based on:		
Group	*N*	*SAT*	*HSG*	*SAT and HSG*
Hearing impaired	75	.61	.52	.61
Learning disabled	1,116	.49*	.50*	.56*
Physically handicapped	92	.63	.55	.66
Visually impaired	256	.47	.48	.53
All handicapped	1,539	.50*	.51	.57*
All applicants (1% sample)	5,328	.55	.55	.61

*Different from All Applicant R, $p < .05$

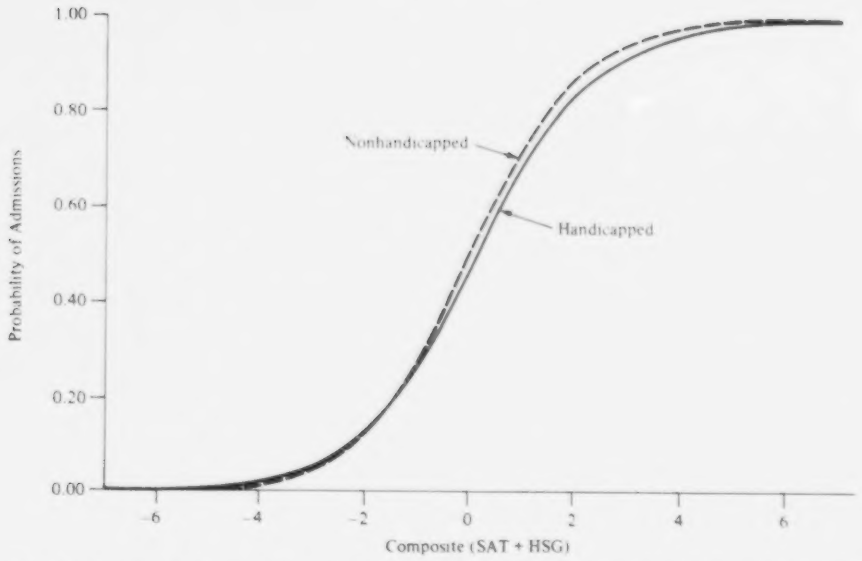

Figure 5. Logistic Functions Showing the Probability of Admissions for Handicapped and Nonhandicapped Applicants, Based on Best Weighted Composite of SAT and HSG Within Colleges.

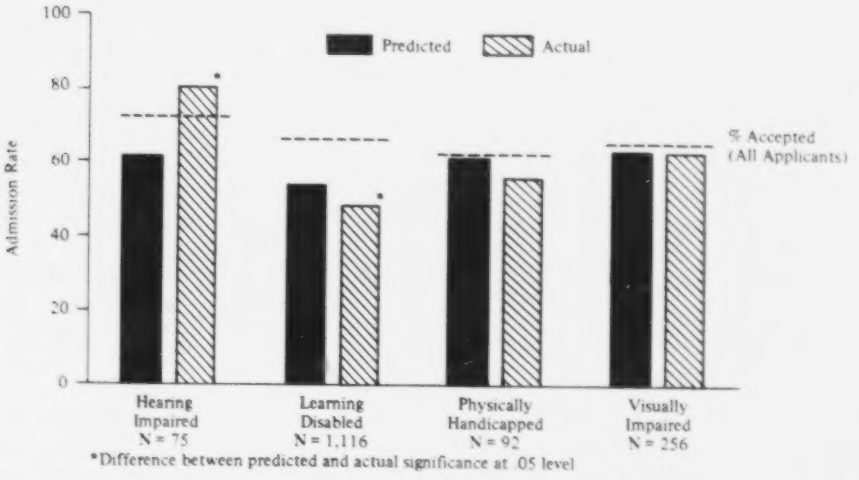

Figure 6. Predicted vs. Actual Admissions Rates for Handicapped Applicants (Sample 1).

would suggest a probability of admission in the range of .60–.90, the handicapped applicant was somewhat less likely to be admitted than was the nonhandicapped applicant. This needs to be examined further through analysis of residuals. A relatively small difference for the total group of handicapped applicants could hide important pockets of more consequential discrepancies.

RESIDUAL ANALYSES

All of the analyses reported in this section follow the same model: For each student within a particular group of handicapped applicants, the probability of admission is estimated on the basis of SAT and/or HSG. Those probabilities are summed across the group to obtain the proportion expected to be admitted, and that number is subtracted from the actual proportion admitted to obtain the residual rate. The purpose is to disaggregate the groups of handicapped students in various ways in order to understand better the conditions and circumstances that may influence admission of these students.

Types of Disabilities

Figure 6 shows predicted (black bars) and actual (cross-hatched bars) admissions rates for the four handicapped groups. The dashed lines indicate the admissions rate for all

Table 6. Residual Admissions Rates for Sample 1 vs. Sample 2 and One vs. Two Predictors

Group	N for Sample 1	N for Sample 2	Predictions based upon SAT/HSG Sample 1	HSG Sample 1	SAT Sample 1	SAT Sample 2
Hearing impaired	75	96	.20*	.15*	.18*	.18*
Learning disabled	1,116	1,438	−.05*	−.05*	−.12*	−.14*
Physically handicapped	92	108	−.04	−.03	−.05	−.02
Visually impaired	256	313	−.01	.01	−.04	−.05
Total handicapped	1,539	1,955	−.03*	−.03*	−.09*	−.10*

*p< .05

applicants at the institution to which the handicapped students applied, weighted according to the number of handicapped applicants that applied to each school. The predicted rate was generally lower than the dashed "all applicant" line because the handicapped applicants tended to have lower SAT and HSG scores than the average applicant (as shown in Figure 3). The key comparison is between the predicted and actual rates. In two cases that difference was significant. The group of hearing impaired applicants was small but had a large and significant positive residual (.20). The learning disabled group was very large. Its residual was small and negative (−.05) but also highly significant. The overall residuals for the physically handicapped and visually impaired groups were not significant. As we shall see from further analysis, there is apparently a specific explanation for the positive residual for the hearing impaired group. The learning disabled group calls for additional analysis because there may be larger negative residual effects within that sizeable group.

First it is necessary to see whether the students with full data (Sample 1) are generally comparable to the larger Sample 2 with missing HSG scores. Table 6 shows several relevant comparisons. Residuals shown in the first column are based on Sample 1, the same analysis as just discussed regarding Figure 6. The last column shows an analysis based on Sample 2 that is significantly different in one respect: The residual for the learning disabled group is noticeably more negative. But that discrepancy is evidently not attributable to some difference in the two samples, as a comparison of the last two columns indicates. The residual results from Samples 1 and 2 look very similar when the predictions are based only on SAT scores in both analyses. Given this result and the quite similar pattern of SAT means for the different handicapped groups across Samples 1 and 2 (Tables 2 and 3), it appears that the smaller Sample 1 with complete data is representative of the larger Sample 2. All further analyses are based on Sample 1. Residual results look similar for the analyses based upon HSG and SAT (the second and third columns) with one exception: The residual for the learning disabled group is more negative when the prediction is based on the SAT than when based on HSG. This raises a question as to whether admissions officers may be skeptical and possibly discount a high test score for a learning disabled student. We come back to this question later upon finding other evidence that suggests this possibility.

Other Handicapped Subgroups

Table 7 shows residual admissions rates for the several handicapped groups further subdivided in various ways. The data do not indicate any important sex differences, nor does there appear to be any significant difference in residual rates for public and private institutions or for institutions that are more or less selective. One qualification to the latter point is the fact that practically all the hearing impaired students applied to the less selective institutions, so that is where their positive residual shows up.

There is a fairly consistent difference in the pattern of residuals for larger and smaller institutions. In particular, physically handicapped and visually impaired applicants show a significant negative residual in the smaller institutions. This "size effect" suggests that students with a disability that requires special equipment or resources may be less likely to be admitted to smaller institutions that may be less able to provide those resources. The data for hearing impaired students shows an effect in the same direction.

Is a college more likely to accept a disabled student, other things being equal, if that institution has developed a program specifically to serve students with his or her disability? It is not unreasonable to assume that a positive residual might be attributed in large part to institutions making a special effort to recruit and enroll students for whom they have a special commitment and educational capability. That appears to be the case with hearing impaired students. Those who applied to institutions that have special programs designed to serve their needs were far more likely to be admitted (97 percent) than would be predicted on the basis of their test scores and grades (66 percent). It is important to note, however, that this result is based largely upon data from a single college. It is impossible to say whether this finding would hold generally for other colleges.

In the other three handicapped groups, a substantial proportion of the applicants (half or more) applied to institutions that announced such special programs for disabled students, but no such effects were found. With the possible exception of hearing impairment, special college

Table 7. Residual Admissions Rates for Handicapped Applicants by Sex and Type of College

	Hearing Impaired		*Learning Disabled*		*Physically Handicapped*		*Visually Impaired*		*Total Handicapped*	
	N	*Resid.*	*N*	*Resid.*	*N*	*Resid.*	*N*	*Resid.*	*N*	*Resid.*
Sex										
Male	(37)	.22*	(760)	−.05*	(55)	−.01	(150)	−.03	(1,002)	−.04*
Female	(38)	.18*	(356)	−.04*	(37)	−.07	(106)	.02	(537)	−.01
College Size										
Larger	(62)	.22*	(746)	−.04*	(67)	.01	(185)	.03	(1,060)	−.01
Smaller	(13)	.07	(370)	−.07*	(25)	−.15*	(71)	−.10*	(479)	−.08*
College Selectivity										
Higher	(6)	−.04	(204)	−.04	(25)	−.01	(53)	.03	(288)	−.03
Lower	(69)	.22*	(912)	−.05*	(67)	−.05	(203)	−.02	(1,251)	−.03
College Control										
Public	(26)	.14	(517)	−.07*	(42)	.00	(126)	.01	(711)	−.05*
Private	(49)	.23*	(599)	−.03	(50)	−.07	(130)	−.02	(828)	−.01
Special Program										
Yes	(32)	.31*	(357)	−.04*	(38)	.01	(100)	−.02	(527)	−.01
No	(43)	.11*	(759)	−.05*	(54)	−.07	(156)	.00	(1,012)	−.04*
Total Handicapped	(75)	.20*	(1,116)	−.05*	(92)	−.04	(256)	−.01	(1,539)	−.03*

*p< .05

programs for disabled students evidently result in no preferential admissions practices.

Another useful way to break down the handicapped groups is to analyze residual admissions rates according to what test form the examinee took. Within a given disability group, students who took the large-type edition of the test would presumably tend to be more disabled than those who took the regular form of the test. Similarly, students who took the cassette or braille version of the test would likely be more disabled than those who took the large-type edition. If residual admissions rates are more negative for students who took those test forms that depart from the regular edition, such a result would suggest a negative preference in admissions for students who are more severely disabled.

Table 8. Residual Admissions Rates for Learning Disabled and Visually Impaired Applicants by Type of Examination

	Learning Disabled		*Visually Impaired*	
Type of Examination	*N*	*Residual*	*N*	*Residual*
Regular	(952)	−.04*	(115)	.00
Large-type	(36)	−.20*	(112)	−.03
Cassette or braille	(87)#	−.05	(27)	.00

*p< .05
cassette only

Within the learning disabled and visually impaired groups, there were sufficient examinees taking different test forms to permit a comparative analysis. The results are shown in Table 8. There does not appear to be any consistent effect, but the relatively small group of learning disabled students who took the large-type edition do show a substantial and significant negative residual (.53 predicted, .33 actually admitted). Closer examination of the scores of this group suggests that these applicants may have presented a picture of having unusual difficulty in academic work. Their HSG was half a standard deviation lower than the normal pattern of underachievement for learning disabled students.

Score Level and Pattern

In college admissions, score level has a special significance beyond the usual expectation that the higher a student's SAT and HSG are, the more likely he or she will be admitted. If scores rank an applicant high within an institution's applicant pool, the probability of admission is high. One might guess that ordinarily such students are readily accepted unless there is some negative sign in the application. Similarly, if scores are in the range where the probability of admission is low, a negative decision may be made with some dispatch unless the student belongs to one of the various subgroups that is actively recruited by the institution. In the uncertain mid-range, however, a wide variety of factors might be taken into account in deciding among a sizeable group of applicants whose academic ability is fairly similar. In other words, the

Table 9. Residual Admissions Rates of Handicapped Applicants for Whom Possibility of Admission Was Low, Uncertain, or High

	Predicted Admissions:							
	0–.25 (Low)		*.25–.75 (Uncertain)*		*.76–1.00 (High)*		*Total*	
Group	*N*	*Residual*	*N*	*Residual*	*N*	*Residual*	*N*	*Residual*
Hearing impaired	(10)	.02	(37)	.35*	(28)	.06	(75)	.20*
Learning disabled	(279)	.00	(483)	−.06*	(354)	−.07*	(1,116)	−.05*
Physically handicapped	(16)	.02	(36)	−.09	(40)	−.01	(92)	−.04
Visually impaired	(43)	.04	(105)	.00	(108)	−.04	(256)	−.01
Total handicapped	(348)	.01	(661)	−.03	(530)	−.05*	(1,539)	−.03*

*$p < .05$

dynamics of the admissions process may vary substantially depending upon whether an applicant is in the low, uncertain, or high range with respect to likelihood of being admitted. An analysis of 25,000 admissions decisions confirmed that those assumptions fit selective private institutions quite well (Willingham and Breland 1982).

Table 9 presents the results of a residual analysis for each of the handicapped groups in three such selection zones: low, uncertain, and high. There are two significant results. One is a very strong positive residual for the hearing impaired group in the uncertain selection range. This result suggests that hearing impaired students are more likely to be admitted if their qualifications are in a gray area, but again, much of this finding is due to data from one institution.

Results for the learning disabled group seem more interesting. Had this group shown a negative residual in the low selection range, it might have suggested some doubt that these students could meet the academic standards of the institution. But negative residuals in the uncertain and high ranges seem to call for some different explanation. One possibility is that admissions officers may be somewhat skeptical of high academic credentials for this particular group. Such skepticism could arise from any of a wide variety of factors visible in the student's background, academic record, references, etc. Experience with prior students may also influence judgment in admitting learning disabled applicants. Braun et al. (in press) reported that learning disabled students who ranked high on SAT and high school grades made substantially lower freshman grades than predicted.

Skepticism as to the academic potential of a learning disabled applicant could be tied specifically to a relatively high test score that is not quite believed. Recall that the residual admissions rate for learning disabled students was −.12 when the predicted rate was based upon SAT scores alone. That residual rate was even a bit higher (−.15 and −.14 in the uncertain and high selection zones, respectively). That result gives an impression that high test scores of learning disabled students may be discounted by admissions officers, but there is another quite plausible explanation: namely, the fact that learning disabled students have low HSG scores in relation to their test scores. Knowing that, one would expect negative residuals when the predictions are based upon test scores alone because those predictions don't take into account other negative evidence that is quite visible in the student's record and is undoubtedly considered by the admissions officer. Of course, both explanations could be partly correct because the latter doesn't explain the significant negative residual when predictors are based on both SAT and HSG.

If there is a slight negative preference for learning disabled students specifically because their test scores tend to be discounted, then decisions for such students would be sensitive to a discordant score pattern. That is, the SAT score would more likely be discounted if it were noticeably higher than the HSG. On the other hand, there would be little reason to discount the score if it were already noticeably lower than the HSG. In order to test the possible influence of score pattern, all learning disabled applicants were categorized into three groups depending upon the relative level of their SAT and HSG within the applicant pool of the college to which they applied. A "higher SAT" group was defined to include all students for whom the SAT Z score was at least .5 higher than the HSG Z score. A "higher HSG" group had the opposite pattern, and all others lay in between with generally similar SAT and HSG scores. A residual analysis was carried out for these three groups of learning disabled students within each of the three selection ranges. The results are shown in Table 10.

There is a hint of the discordant score effect, barely significant, in the uncertain zone. Applicants with higher SAT scores did have a slightly more negative residual than did applicants with higher HSG scores. But within the high selection range, the data tended to go in the opposite direction. Residuals in the last column of Table 10 indicate that for the total group of learning disabled applicants, score pattern evidently played no role in admissions decisions. This result makes the SAT discounting hypothesis seem implausible.

Table 10. Residual Admissions Rates for Learning Disabled Applicants with Discrepant SAT/HSG Scores

	Predicted Admissions:							
	0–.25 (Low)		*.25–.75 (Uncertain)*		*.76–1.00 (High)*		*Total*	
Group	*N*	*Residual*	*N*	*Residual*	*N*	*Residual*	*N*	*Residual*
Learning disabled								
Higher SAT	(146)	.03	(235)	−.08*	(184)	−.04	(565)	−.05*
Similar SAT, HSG	(76)	−.02	(144)	−.05	(106)	−.10	(326)	−.06*
Higher HSG	(57)	−.05	(104)	−.03	(64)	−.09	(225)	−.05
Total	(279)	.00	(483)	−.06*	(354)	−.07*	(1,116)	−.05*

*p< .05

Flag Format

The main purpose of this study was to examine the outcome of actual admissions decisions for handicapped applicants who had taken special administrations of the SAT, particularly in order to see whether similar admissions standards are applied to such students. A strong motive in undertaking this study, however, was to determine whether there is evidence of any negative preferences in the admission of handicapped students that inadvertently might be facilitated by the fact that scores from special test administrations carry an identifying flag. Without a true experiment involving random flagging of nonstandard scores, there is no way to be sure as to whether the flag itself has any direct effect on admissions decisions. There was, however, a variation in the manner in which nonstandard scores were identified, and that difference in "flag format" seemed worth examining.

Some colleges obtain their SAT scores on a magnetic tape. In 1982–83 these institutions received a roster of those applicants with nonstandard scores rather than flags on the scores. If there were a strong negative residual associated with score flags but not with roster flags, it could be argued that flags do have an effect when they are surely visible, but that flags on rosters do not because they are set aside and never noticed.

Table 11. Residual Admissions Rates for Handicapped Applicants According to Whether Flags Were Transmitted on Score Reports or Rosters

	Flags on Scores		*Flagged by Roster*	
Group	*N*	*Residual*	*N*	*Residual*
Hearing impaired	(13)	.04	(62)	.23*
Learning disabled	(506)	−.03	(610)	−.06*
Physically handicapped	(36)	.02	(56)	−.07
Visually impaired	(100)	.03	(156)	−.03
Total handicapped	(655)	−.02	(884)	−.04*

*p< .05

Table 11 shows a residual analysis for students who applied to those institutions that were notified by the two flagging methods. The significant residual effects appear in those institutions that received flags by rosters rather than on score reports. Whether this difference is actually associated with the method of identifying nonstandard scores is impossible to say since there is no way to determine reliably what individual institutions actually did with the rosters. The observed difference may result simply from some characteristic of institutions that request scores by different methods, though no such distinction could be detected.

SUMMARY

Regulations under Section 504 of the Rehabilitation Act of 1973 contain several mandates concerning admissions testing and handicapped people. A dilemma in implementing those regulations arose because of a contradiction between (a) the professional practice of flagging test scores of handicapped students based upon nonstandard and possibly noncomparable tests and (b) the regulations' prohibition against preadmission inquiry regarding handicapped status. Pertinent to this issue is the question of whether institutions apply the same standards in admitting handicapped and nonhandicapped applicants and the possible role that test score flags might play, even inadvertently, in admissions decisions. The purpose of this study was to shed light on these issues by comparing admissions decisions of handicapped applicants with those of nonhandicapped applicants who have comparable SAT scores and high school grades.

The study focused upon 1,539 handicapped students who applied to 121 institutions that participated in the College Board's Summary Reporting Service in 1982–83. The primary method of analysis was to develop separate logistic regression equations for each institution (total N = 532,750) to predict admissions decisions on the basis of SAT and HSG for all applicants to each college. On this basis, the predicted and actual admissions rates were compared for a number of different groups of handicapped

applicants. The principal findings were as follows:

1. Compared to other applicants to the same college, the physicially handicapped and visually impaired groups were slightly below average with respect to their academic qualifications, learning disabled students were lower, and hearing impaired applicants ranked lowest in relation to nonhandicapped applicants. In general, handicapped applicants tended to rank significantly lower on HSG than on SAT: 39 percent were above the average of nonhandicapped applicants to the same college on SAT; 24 percent were above average on HSG.

2. Overall, admissions decisions for handicapped applicants followed quite closely what one would expect from their HSG and SAT scores, though the correlation between admissions decisions and either SAT or HSG was slightly lower for handicapped applicants than for nonhandicapped applicants. This result suggests that factors other than SAT and HSG play a slightly larger role in the case of handicapped applicants, though not necessarily to their advantage.

3. Within the total group of handicapped applicants, there were three pockets of students for whom the actual admissions rate was significantly different from the rate predicted on the basis of all-applicant logistic equations.

(a) Hearing impaired applicants were substantially more likely to be admitted than would be indicated by their HSG and SAT scores (residual = +.20; 15 students admitted above the number predicted).

(b) Learning disabled students who ranked in the mid- to upper range among applicants at the college to which they applied were slightly less likely to be admitted (residual = −.06; 52 fewer students admitted than predicted). This negative effect was noticeably stronger in a very small group of students who took the large-type version of the SAT and were evidently more disabled.

(c) Admissions were lower than predicted for a relatively small number of visually impaired and physically handicapped students applying to the smaller institutions (residual = −.10; 11 fewer students admitted than predicted).

4. Some results suggested the possibility that relatively high test scores of learning disabled students might be discounted by admissions officers. Discordant score patterns (high SAT, low HSG; high HSG, low SAT) were examined in order to evaluate that possibility. Admissions decisions did not differ according to score pattern.

The main finding in this study is that the handicapped applicants were admitted on much the same basis as the nonhandicapped applicants, though there were instances where particular groups of handicapped applicants were somewhat more or less likely to be admitted than would be expected. These data suggest that to the extent that there are differences in admissions decisions between handicapped and nonhandicapped students, those different decisions are likely based upon the full record of the student rather than a particular item of information. The findings are inconsistent with the assumption that admissions officers focus special attention upon test scores in evaluating the applications of handicapped students.

NOTES

1. Another complication arose in *Grove City v. Bell* 1984. In that case the Supreme Court held that sex discrimination regulations cannot be enforced throughout a college merely because some of its students received financial aid. This decision cast much uncertainty on the assumption that admissions practices were covered by Section 504. Several legislative initiatives have sought to remedy that ambiguity, but none have come to vote as of this writing. See DiDonato 1986 for an analysis of *Grove City*.

2. In the CIRP annual survey (Astin et al., 1985 and earlier) the forms of the questions concerning handicapped status read as follows:

1978–80

35a. Do you consider yourself physically handicapped?
No _____ Yes _____
(Data reported as proportion of freshmen)

35b. If yes, what type of handicap do you have? (Mark all that apply)
Hearing _____ Learning disability _____
Speech _____
Visual _____ Other _____
Orthopedic _____
(Data for Q35b reported as % of Q35a)

1981–82

38a. Do you have a disability?
No _____ Yes _____
(Data reported as proportion of freshmen)

38b. If yes, what is your disability? (Mark all that apply)
Hearing _____ Learning disability _____
Speech _____
Visual _____ Health-related _____
Orthopedic _____ Other _____
(Data for Q38b reported as % of Q38a)

1983–85

33. Do you have a disability? (Mark all that apply)
None _____ Health-related _____
Hearing _____ Partially sighted or blind _____
Speech _____
Orthopedic _____ Other _____
Learning disability _____
(Data reported as proportion of freshmen)

3. HSG was derived as follows. Self-reported rank was rescaled (rank*) to have the same X and S.D. as the average of the four subject grades reported by the student (HSA). If both rank* and HSA were available, the student was assigned an HSG equal to an equally weighted composite of the two, rescaled to the X and S.D. of HSA. Otherwise students were assigned an HSG equal to HSA or rank*, whichever was available.

4. For these and other residual analyses reported here, the standard error for testing the significance of differences between predicted and actual group membership was $(\Sigma\ p_i q_i)^{1/2}$. This test can be shown (Paul Rosenbaum, personal communication) to be conservative compared with the much more laborious exact test provided by Haberman (1976).

5. To further test whether less weight was given to SAT and HSG in reviewing the applications of handicapped students, admissions decisions were predicted in a logistic regression model suggested by Paul Rosenbaum. The primary variables were SAT, HSG, handicap status, and the interaction of handicap status with SAT and HSG. The logit of institutional selection rate and the institutional means for SAT and HSG were also included to control for college selectivity. The analysis was based upon all handicapped students (Sample 1) plus a 1 percent sample of nonhandicapped applicants. Results for three models are shown in Table A. Models 1 and 2 correspond approximately to columns one and two of Table 5, but do not allow for institutional variation in regression weights. When selection decisions were predicted from SAT (Model 1), the interaction with handicap status was small but significant, indicating that slightly less weight was placed on the SAT in reaching decisions about handicapped applicants (.046 versus .055). Results for Model 2 were similar but not significant (P = .09); nor were the interactions in Model 3 significant. When interaction terms were omitted from Model 3, the term for handicapped status was significant, as would be expected from the small but significant residual for handicapped status (−.03) reported in Table 6.

Table A. Logistic Prediction of Admissions Decisions from SAT and HSG for a Pooled Sample of Handicapped (N = 1,539) and Nonhandicapped (N = 5,328) Applicants – Regression Weights for Three Models Based on Different Variables

Variable	*Model 1*	*Model 2*	*Model 3*
Predictors			
SAT	.055*		.041*
HSG		1.935*	1.491*
Handicap status			
Handicapped	.296	.487	.436
Interaction (H x SAT)	−.009*		−.003
Interaction (H x HSG)		−.216	−.111
College variables			
Mean SAT	−.052*		−.041*
Mean HSG		1.761*	−1.291*
Selection rate	1.165*	1.777*	1.270*

*p<.01

6. The logit, which appears as the term **XB** in the logistic equation on page 7, was used as the composite predictor (SAT + HSG) indicated in Figure 5. This metric weights the predictors appropriately in each college, maintains the linear character of the composite predictor, and adjusts for institutional differences in selection standards.

REFERENCES

Admissions Testing Program. 1985. *ATP services for handicapped students: 1985–86 information for counselors and admissions officers*. New York: College Entrance Examination Board.

Admissions Testing Program. 1983. *National college-bound seniors, 1983*. New York: College Entrance Examination Board.

American Association of Collegiate Registrars and Admissions Officers and the College Board. 1980. *Undergraduate admissions: The realities of institutional policies, practices, and procedures*. New York: College Entrance Examination Board.

American Educational Research Association, American Psychological Association, and National Council on Measurement in Education. 1985. *Standards for educational and psychological testing*. Washington, D.C.: American Psychological Association.

Astin, A. W., Green, K. C., Korn, W. S., and Schalit, M. 1985. *The American freshman national norms for fall 1985*. Los Angeles: Higher Education Research Institute, Cooperative Institutional Research Program, University of California.

Bennett, R. E., Rock, D. A., and Kaplan, B. A. 1985. *The psychometric characteristics of the SAT for nine handicapped groups*. ETS RR-85-49. Princeton, N.J.: Educational Testing Service.

Braun, H., Ragosta, M., and Kaplan, B. (in press). *The predictive validity of the SAT for disabled students*. Princeton, N.J.: Educational Testing Service.

Breland, H., Wilder, G., and Robertson, N. (in preparation). *Survey of undergraduate admissions policies, practices, and procedures*. Princeton, N.J.: Educational Testing Service.

Department of Health, Education and Welfare (DHEW). 1977. Nondiscrimination on basis of handicap. *Federal Register, 42*(86), p. 22, 683, Section 84.42.

DiDonato, P. A. 1986. The impact of the Grove City college decision on Section 504 of the Rehabilitation Act and other civil rights laws. *AHSSPPE Bulletin, 4*(2), pp. 52–62.

Educational Testing Service. September 3, 1985. *Flagging of admissions test scores of handicapped people: A position paper.* Princeton, N.J.: Educational Testing Service.

Farina, A., and Felner, R. D. 1973. Employment interviewer reactions to former mental patients. *Journal of Abnormal Psychology, 82*, pp. 268–72.

Grove City College v. Bell, ___ U.S. ___, 104 S. Ct. 1211 (1984).

Guskin, S. L. 1982. The effects of knowing someone is handicapped on decision making: A review of the literature – Appendix A. In Sherman, S., and Robinson, N. *Ability testing of handicapped people: Dilemma for government, science, and the public*. Washington, D.C.: National Academy Press.

Haberman, S. J. 1976. Generalized residuals for log-linear models. In *Ninth International Biometric Conference Proceedings*, pp. 104–22. Raleigh, N.C.: Biometric Society.

Johnson, R., and Heal, L. W. 1976. Private employment agency responses to the physically handicapped applicant in a wheelchair. *Journal of Applied Rehabilitation Counseling, 7*, pp. 12–21.

Krefting, L. A., and Brief, A. P. 1977. The impact of applicant disability on evaluative judgments in the selection process. *Academy of Management Journal, 19*, pp. 675–80.

Liscio, M. A. (Ed.). 1986a. *A guide to colleges for mobility impaired students*. Orlando, FL: Academic Press.

Liscio, M. A. (Ed.). 1986b. *A guide to colleges for visually impaired students*. Orlando, FL: Academic Press.

Mangrum, C. T., and Strichart, S. S. (Eds.). 1985. *Peterson's guide to colleges with programs for learning-disabled students*. Princeton, N.J.: Peterson's Guides Inc.

Nickoloff, O. M., II. 1962. Attitudes of public school principals toward employment of teachers with certain physical disabilities. *Rehabilitation Literature, 23*(11), pp. 344–45.

Oltman, P., and Hartnett, R. 1984. *The role of GRE general and subject test scores in graduate program admission*. (GRE Board Research Report GREB No. 81-8R and ETS Research Report 84-14). Princeton, N.J.: Educational Testing Service.

President's Committee on Employment of the Handicapped. (undated.) *The disabled college freshman*. Washington, D.C.: President's Committee on Employment of the Handicapped.

Ramist, L., and Arbeiter, S. 1983. *Profiles, college-bound seniors, 1983*. New York: College Entrance Examination Board.

Rawlings, B. W., Karchmer, M. A., and DeCaro, J. J. (Eds.). 1983. *College and career programs for deaf students*. Washington, D.C.: Gallaudet College and Rochester, N.Y.: National Technical Institute for the Deaf at Rochester Institute of Technology.

Redden, M., Levering, C., DiQuinzio, D., and the Task Force on a Model Admissions Policy. 1978 (rev. 1985). *Recruitment, admissions, and handicapped students: A guide for compliance with Section 504 of the Rehabilitation Act of 1973*. Washington, D.C.: American Association of Collegiate Registrars and Admissions Officers and the American Council on Education.

Rickard, T. E., Triandis, H. C., and Patterson, C. H. 1963. Indices of employer prejudice toward disabled applicants. *Journal of Applied Psychology, 47*, pp. 52–55.

Rose, G. L., and Brief, A. P. 1979. Effects of handicap and job characteristics on selection evaluations. *Personnel Psychology, 32*, pp. 385–92.

Sherman, S., and Robinson, N. 1982. *Ability testing of handicapped people: Dilemma for government, science, and the public*. Washington, D.C.: National Academy Press.

Walker, S. H., and Duncan, D. B. 1967. Estimation of the probability of an event as a function of several independent variables. *Biometrika, 54*, pp. 167–79.

Willingham, W. 1985. *Success in college*. New York: College Entrance Examination Board.

Willingham, W. 1986. *Testing handicapped people: The validity issue*. (ETS-RR-86-26.) Princeton, N.J.: Educational Testing Service.

Willingham, W., and Breland, H. 1982. *Personal qualities and college admissions*. New York: College Entrance Examination Board.